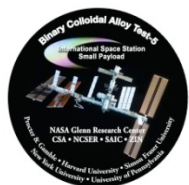




Binary Colloidal Alloy Test (BCAT-5)



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PI: Prof. David Weitz and **Co-I:** Dr. Peter Lu, Harvard University
PI: Prof. Barbara Frisken and **Co-I:** Dr. Arthur Bailey, *Simon Fraser University / Canadian Space Agency (CSA)*
PI: Prof. Paul Chaikin and **Co-I:** Dr. Andrew Hollingsworth, NYU
PI: Prof. Arjun Yodh, U. Penn.
PS: Dr. William V. Meyer, NCSER at NASA GRC
PM: Ronald Sicker, NASA GRC
Engineering Team: ZIN Technologies, Inc.

Objectives:

- ◆ Measure phase separation rates in $\mu\text{-g}$ to develop underlying theory for predicting product shelf-life (P & G). Collapse [irreversible separation] occurs on Earth and must be mitigated with expensive particle additives.
- ◆ Photograph initially randomized colloid samples onboard the International Space Station (ISS) to determine their resulting structure over time. Ten colloidal samples will study: phase separation kinetics (Lynch, Weitz, and Lu), phase separation competing with crystallization (Frisken and Bailey), how seed particle size and concentration effect crystal growth in microgravity (Chaikin and Hollingsworth), and seeing temperature controlled melting and crystallization. (Yodh).

Relevance/Impact:

- ◆ These samples will provide important data that is not available on Earth; data which can guide our understanding of phase separation (e.g., shelf-life, product collapse), how it competes with crystallization to impact production (e.g., when making plastics), and how particle seeding impacts the rate and type of order that arises out of disorder.

Development Approach:

- ◆ Flight design uses existing (BCAT-4) flight spare hardware and an addition that allows us to quantify scattering angles for crystals formed in space.
- ◆ Using the EarthKAM set-up already on the ISS minimizes upmass / volume, costs, and crew supervision, while increasing quantity and quality of data.
- ◆ CSA Crew Members available during 2J/A and Increment-19.
- ◆ Transition to Nikon D2SX 12-MPixel camera from present 8-MPixel camera.



BCAT-5 Slow Growth Sample Module

Astronaut Dan Tani photographing the BCAT-3 Sample Module using his own design for a ceiling mount in Node 2 of the International Space Station.



ISS Resource Requirements

Accommodation (carrier)	ISS seat track setup
Upmass (kg) (w/o packing factor)	2.7 kg (BCAT-5 module) + batteries
Volume (m³) (w/o packing factor)	1.76×10^{-3}
Power (kW) (peak)	132 Watts (laptop and camera) + 36 AA-batteries for BCAT-5
Crew Time (hrs) (installation/operations)	60 hrs. (BCAT-5, ~ Inc.19, 20)
Autonomous Ops Time (hrs)	4080 hrs. (BCAT-5, ~ Inc. 19, 20)
Launch / Increment	2J/A, Inc. 19 -

Project Life Cycle Schedule

Milestones	SCR	RDR	PDR	CDR	VRR	Safety	FHA	Launch	Ops	Return	Final Report
Actual/ Baseline (BCAT-5)	HQ approval +3 m	N/A	N/A	N/A	N/A	Jan 2009	Jan 2009	5/09	Inc. 19,20	Ops + 6 m	Sept. 2010
Documentation	Website: eRoom:				SRD: EDMP:			Project Plan: SEMP:			